

## HYDROFRACTURE PROPERTIES VIA SIGNALS FROM HYDRAULIC PUMPS: AN OVERVIEW

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### ABSTRACT

*Huge water powered breaking is utilized to upgrade creation from the low porous diatomite fields of Kern County, CA. Albeit discriminating for outlining infusion and recuperation well examples, the in-situ pressure driven break geometry is ineffectively caught on. In 1990, Shell led a broad seismic observing investigation on a few hydro fractures preceding a steam drive pilot to portray hydro-fracture geometry. The seismic information was recorded by established down hole geophone exhibits in three perception gaps MO-1, MO-2, and MO-3 situated close to the water-powered break treatment wells. Utilizing low pass separating and move out the investigation, occasions in the geophone recordings are distinguished as cone-shaped shear waves emanating from tube waves going down the treatment well. These circumstances give off an impression of being made by the water powered pumps after their amplitudes are connected with the infusion rate and the wellhead weight. Funnel-shaped wave amplitudes are identified with the tube wave constriction in the treatment well and to wave-engendering qualities of the steep part going in the earth. Amid the primary breaking stage, geophones over the crack zone for wells MO-1 and MO-2 both generally along the construed vertical break plane is shown cone-shaped wave abundance builds that are brought on by shear wave reflection scattering off the highest point of a break zone. From changes in the reflection adequacy as a component of profundity, we translate that the break zone at first stretches out along a bound vertical plane at an acuity that corresponds with a significant portion of the micro-seismic occasions. Around the fundamental's end breaking stage, the crack zone augments upward furthermore reaches out in width, in spite of the fact that we can't focus the crack's measurements from the reflection amplitudes alone. For all wells, we watch that the reflection and what we induce to be the beginning break starts amid a period where no checked change in break weight or infusion rate or slurry focus has been watched. As the primary cracking stage advanced, we observed a considerable reduction insufficiency for geophones underneath the highest point of the break zone. The weakening was most proclaimed for wells MO-1 and MO-2 along the crack plane. Notwithstanding, close to the primary's end stage, well MO-3 likewise showed a considerable abundance decline, recommending the improvement of a broke "procedure zone" around the principle crack plane. In the expansion, well MO-3 similarly displayed an adequacy diminish in an interim well underneath the first break zone. Both the temporary and the heading toward MO-3. Compare with temperature log expands saw amid later steam infusion.*

**KEYWORDS:** *Hydro Fracture, Conical & Wave*

**Received:** Oct 05, 2017; **Accepted:** Oct 25, 2017; **Published:** Jan 23, 2017; **Paper Id.:** IJMPERDFEB201885

### INTRODUCTION

A standout amongst the most productive oil territories in the United States is the region close Kern County, CA. In Kern County, there are a few noteworthy oil fields such as Midway-Sunset, Belridge, Lost Hills, Elk Hills, also, Buena Vista. The aggregate oil set up estimates for the areas over 10 billion barrels is similar to that of Prudhoe Bay. A significant part of the oil is created from diatomaceous rocks late and middle Miocene (Biot,

1956). That is exceptionally permeable 25–65%, rich in oil 35–70% oil immersion. Thick the supply interval is commonly around 1000 ft. Also, with no penetrability 0.1–10 MD Ilderton et al., 1996. Wells was creating from the diatomite experiences substantial water-powered cracking to make up for the low supply penetrability. Commonly, three to eight interims inside of the store interim are cracked (Geertsmas & de Klerk, 1969). Every crack in a perfect world results in a solitary slender less than 1 in. thick. Vertical ellipsoid with two symmetric wings transmitting without end from the wellbore arranged opposite to the direction of slightest primary anxiety (Ilderton et al., 1996). The coveted arm compass of every crack is regularly around 300 ft tip-to-tip, and the sought stature speaks the truth 100–150 ft. Wells are thickly separated every 165 ft or less., making the learning of hydraulic break geometry orientation, length, stature, symmetry and profundity fundamental in deciding ideal right areas (Lacy, 1987).

To pick up a superior comprehension of hydro-fracture geometry in the diatomite, Shell observed a few hydro fractures impelled in the South Belridge field, utilizing dynamic and aloof seismic systems. Three perception wells were outfitted with more than 60 geophone cases solidified behind packaging (Meredith et al., 1991). From shear wave micro seismicobser-vations only extremely feeble P-waves were distinguished it was presumed that for one hydro-fracture on an expert during great 543P. The crack zone was about vertical. As opposed to watching one crack over the entire aperture interim, the micro-seismic information demonstrated that there were two distinct crack zones relating to high porosity interims (White, 1965). The upper break developed almost 60 ft over the punctured acting. The introduction of the hydro-fracture was more or less N26E. Dynamic seismic observing proposed a broad process zone up to 40 ft in the breadth of decreased shear wave speed encompassing the hydro-fracture. Meadows and Winterstein 1994 likewise deduced the vicinity of a vast process zone (Gale et al., 2007). Who utilized VSP geometry to screen a hydro-fracture in the Lost Hills diatomite? A whole process zone is steady with the model, who anticipated an area of militancy around the hydro-fracture. Utilizing numerical demonstrating in Mahrer and Mauk 1986. Demonstrated that this dilatants zone makes a low-speed region around the hydro-fracture and the Investigation of Enhanced Oil Recovery (EOR) Surfactants on Clay Mixed Sandstone Reservoirs for Adsorption (McDermott et al., 2006).

Examination of micro-seismic information from two other hydro fractures at adjacent steam infusion wells, IN2U also, IN2L. Additionally demonstrated that micro-seismic occasions were restricted to the most permeable zones inside of the puncturing interim (Stober & Bucher, 2007). For one well, the micro-seismic occurrences happened symmetrically in a vertical plane around the wellbore, while for another indeed, the occasions were very uneven. Once more, an extensive process zone ha construed; be that as it may, the procedure zone could likewise have been brought about by vulnerabilities in entry time picking or vulnerability in shear wave speed. Utilizing cone-like shear waves produced by the air gun as the piece of the dynamic checking test., (Kumar, & Shandilya, 2014) had the capacity measure spatial varieties in shear wave speed and at that point find micro-seismic occasions utilizing these variable speeds. Cone-like waves are made when a wave engenders up or down a borehole with a pace that is higher than the encompassing development speed (Meng, 2010). These waves are the borehole simple of head waves utilized as a part of refraction seismology and Performance, emission and combustion characteristics of a diesel engine with the effect of the thermal barrier coating on the piston crown using biodiesel. The cone-shaped wavefront spreads far from the borehole at an edge that is identified with the proportion between the development speed and the drilling spread speed (Julius et al., 2015). Central concepts of Experimental investigation on the performance and emission characteristics of the diesel engine with the effect of ferrocene as an additive to diesel fuel. In the diatomite, the shear wave speed is around 2000 ftrs while the tube wave speed in a cased well speaks the truth 4300 ftrs, and cone-shaped waves transmit far from the borehole at a wavefront-normal edge with

admiration to the borehole pivot of around 558 (Manickam et al., 2015), (Rajan et al., 2015).

## RELATED WORKS

The porousness of the cracked upper mainland hull is a characteristic property of a mind-boggling arrangement of rocks, breaks and fault systems that describes the stream properties of that framework. The penetrability of the crystalline storm cellar rocks diminishes with profundity. Porousness can be gotten from water-powered good test information in subterranean boreholes. Just a modest bunch of such profound wells exist even on an overall premise. Subsequently, not very many data exists to the profundity of 4 – 5 km, which is most intriguing for geothermal vitality utilize. For the most part, separation and penetrability of flaws could be gotten from enduring pumping-tests (Selvakumar et al., 2014). Determined permeabilities of the high-class change over an extensive territory relying upon the standard shake sort in the drag and the event of break and blame frameworks in a crystalline cellar. The penetrability of the crystalline cellar shifts with time because of misshapen related changes of opening and crack or blames geometry and because of substance response of streaming liquids with the solids uncovered along the cracks. Especially disintegration furthermore, precipitation of minerals add to the variety of the penetrability with time. The time reliance of  $\kappa$  is hard to measure straightforwardly. At profundities underneath the most bottomless wells to the weak, pliable progress zone proof of penetrability variety with time can be found in surface exposures of rocks initially from this profundity. Uncovered aqueous response veins are incredibly healthy in mainland crustal shakes and witness fossil penetrability and its variety with time (Sankar et al., 2017). A quantitative depiction of porousness variety with time in the more profound parts of the weak piece of the mainland covering isn't conceivable on display.

## HYDROFRACTURE AND SEISMIC MONITORING GEOMETRY

IN2U was a steam infusion all around bored to a profundity of 1620 ft 490 m. What's more punctured somewhere approximately 1120 and 1450 ft. The hydro-fracturing of IN2U kept going two days, what's more, comprised of a little volume hydro-fracture the mini fracture on the first day, trailed by a more significant volume hydro-fracture the principle breach on the second day. Fig. 1a demonstrates the infusion rates and the wellhead weights recorded amid the five distinctive infusion times of the manufacturer. An answer to 2% KCl saline solution was utilized as the infusion liquid for the early stages 1–3 of the manufacturer. For phase 4, 40 lb cross-connected gel has employed. Albeit no administrator notes of the hydro-fracture were accessible, we accept that steps 1–3 have been performed to start the crack close to the wellbore, while stage 4 has completed with higher-consistency gel keeping in mind the end goal to discover the break reviving weight and the base in-situ stress extent. The aggregate volume of infused liquids amid the mini fracture was 940 bbl 133 m<sup>3</sup>. After the mini rupture, the well was closed in for 24 h to permit the infused KCl to permeate into the micro-fractures made amid the mini split. The principle hydro-fracture has built in seven stages over a 4-h period on the second day of pumping. Wellhead weight history and infusion rate history appear in Fig. 1b. Amid scenes one, what's more, 2, KCl took after by 40 lb cross-connected gel was used to revive the crack. Amid stages 3–7, a fluid-proppant blend of cross-connected gel and 20r40 Ottawa sand was pumped into the hydro-fracture. The aggregate volume of infused liquids and proppant amid the first hydro-fracture

If the micro-seismic occasion areas are considered to be illustrative of the crack geometry, then cone-like wave lessening would be relied upon to be present in all wells starting at a profundity of about 1210 ft. Perception well geophones situated previously 1210 ft, would record cone-like wave reflection off the top of the crack zone. Cone shaped

wave reflection

Impacts over the upper crack zone would be typical to be biggest at well MO-1, yet would be exceptionally little at well MO-3 unless a considerable procedure zone existed. Cone shaped waves transmitted through or around the crack zone would likewise experience the best lessening towards well MO-1, and transmission-related lessening would, once more, be relied upon to be little at well MO-3, unless a considerable procedure zone were available.

## RESULT AND DISCUSSIONS

The variety of (a) the influenced zone; (b) the crack thickness; and (c) the standard gap and sliding separation with the heading of most last rule push. Here, "Conclusive" alludes to the qualities after liquid weight dispersal.

Initially, we reproduced the breaking forms under various estimations of infusion rate with an inadequately associated conventional crack system. The standard crustal anxiety point  $\psi$  is to set to  $3\pi/4$ . The last crack system arrangements appear in Figure. Apparently, the necessary pressure driven breaks have framed when the estimation of M is little. By differentiate, the vast estimate of M will initiate the exceptionally complex break arrange. In this way, the influenced territory increment with the expanding of M has appeared. The primary reason is the confinement unsteadiness of water driven crack spread can be somewhat smothered by liquid consistency when the infusion rate is high. The strength issue of pressure driven break spread has talked about in our past work.

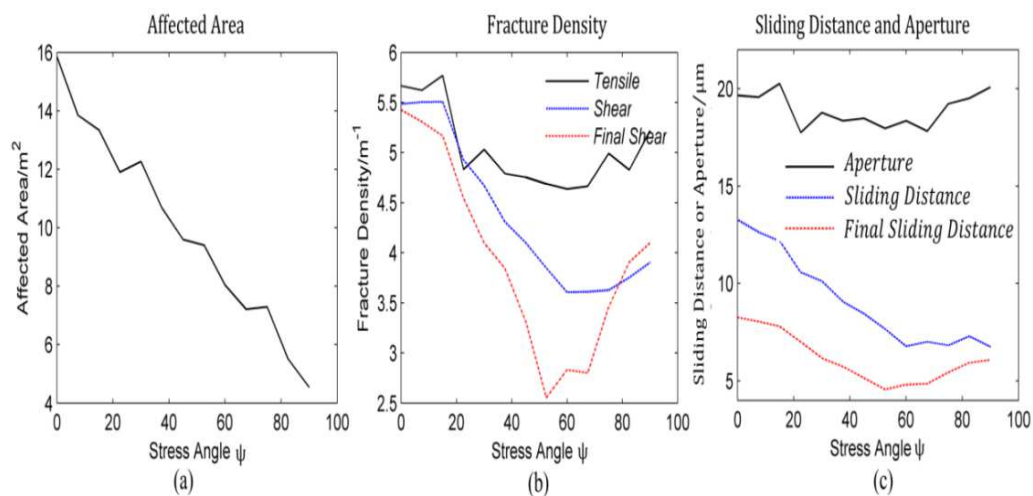


Figure 1: Analysis

## CONCLUSIONS

Inactive recording of funnel-shaped waves from the treatment well pumps gives another procedure to checking hydro fractures. The cone-shaped wave amplitudes are influenced by tube wave engendering in the treatment well and by shear wave diffusing and shadowing impacts in the zone between the procedures well and the perception well. We watched critical dissipating and effects shaded for one judgment well MO-1 situated along the break azimuth, and dynamic weaker has implications as the introduction of the opinion moved far from the gathered break

Introduction the dissemination of adequacy with profundity yields data about the vertical degree of the break. We gathered a break zone underneath the profundity of 1170 ft with the stature of giving or take 40 ft and developing toward MO-1 and MO-2. We too translate a little crack shaped opposite to the fundamental break focused at 1430 ft amid

the later times of treatment, minor time changes in the hydro-fracture disseminating impacts show that the necessary break somewhere around 1150 and 1240 ft develops to turn into a hydro-fracture procedure zone rather than a single tear. The width of this procedure zone can't resolve.

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